

CLAIMS

What is claimed is:

1 1. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic
3 module comprising:

4 a base;

5 a back plane including a plurality of edge connectors and
6 a host connector to couple to a host system;

7 a plurality of printed circuit boards each having an edge
8 connector and an optoelectronic device coupled thereto in
9 parallel to the optical axis of the optoelectronic device, the
10 plurality of printed circuit boards each having its respective
11 edge connector coupled to the respective edge connector of the
12 back plane; and

13 a shielded housing coupled to the base to encase the
14 plurality of printed circuit boards to reduce electromagnetic
15 interference (EMI).

1 2. The fiber optic module of claim 1 further comprising:

2 an optical block coupled to each of the optoelectronic
3 devices of the plurality of printed circuit boards, the
4 optical block having

5 a plurality of openings to receive each of the
6 optoelectronic devices of the plurality of printed circuit
7 boards, and

8 a plurality of lenses to couple photons between each of
9 the optoelectronic devices of the plurality of printed circuit
10 boards and a plurality of optical fibers respectively.

1 3. The fiber optic module of claim 2 further comprising:
2 a nose to receive an optical fiber connector and to hold
3 the plurality of optical fibers substantially fixed and
4 aligned with the plurality of openings of the optical block.

1 4. The fiber optic module of claim 3 further comprising:
2 a nose shield surrounding the nose to reduce
3 electromagnetic interference.

1 5. The fiber optic module of claim 1 wherein,
2 the back plane includes traces between the plurality of
3 edge connectors and the host connector.

1 6. The fiber optic module of claim 1 wherein,
2 the host connector is a plurality of pins.

1 7. The fiber optic module of claim 1 wherein,
2 the host connector is an electrical connector including a
3 plurality of pins.

1 8. The fiber optic module of claim 1 wherein,
2 the plurality of printed circuit boards is a plurality of
3 vertical printed circuit boards.

1 9. The fiber optic module of claim 8 wherein,
2 the plurality of vertical printed circuit boards are each
3 arranged perpendicular to the base and parallel to each other
4 to form a horizontal array of fiber optical channels.

1 10. The fiber optic module of claim 8 wherein,

2 the plurality of vertical printed circuit boards are
3 stacked up with each arranged perpendicular to the base to
4 form a vertical array of fiber optical channels.

1 11. The fiber optic module of claim 1 wherein,
2 the plurality of printed circuit boards is a plurality of
3 horizontal printed circuit boards.

1 12. The fiber optic module of claim 11 wherein,
2 the plurality of horizontal printed circuit boards are
3 each arranged parallel to the base to form a horizontal array
4 of fiber optical channels.

1 13. The fiber optic module of claim 11 wherein,
2 the plurality of horizontal printed circuit boards are
3 stacked up with each arranged parallel to the base and to each
4 other to form a vertical array of fiber optical channels.

1 14. The fiber optic module of claim 1 wherein,
2 the plurality of printed circuit boards is a plurality of
3 slanted printed circuit boards.

1 15. The fiber optic module of claim 14 wherein,
2 the plurality of slanted printed circuit boards are
3 stacked up with each arranged parallel to each other to form a
4 vertical array of fiber optical channels.

1 16. The fiber optic module of claim 14 wherein,
2 the plurality of slanted printed circuit boards are each
3 arranged parallel to each other on an angle with the base to
4 form a horizontal array of fiber optical channels.

1 17. The fiber optic module of claim 1 wherein,
2 the plurality of printed circuit boards is a combination
3 of slanted printed circuit boards and vertical printed circuit
4 boards.

1 18. The fiber optic module of claim 1 wherein,
2 the plurality of printed circuit boards is a combination
3 of slanted printed circuit boards and horizontal printed
4 circuit boards.

1 19. The fiber optic module of claim 1 wherein,
2 the plurality of printed circuit boards is a combination
3 of vertical printed circuit boards and horizontal printed
4 circuit boards.

1 20. The fiber optic module of claim 1 wherein,
2 the plurality of printed circuit boards is a combination
3 of vertical printed circuit boards, horizontal printed circuit
4 boards and slanted printed circuit boards.

1 21. The fiber optic module of claim 1 wherein,
2 each of the plurality of printed circuit boards includes
3 a ground plane on one side.

1 22. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic
3 module comprising:
4 a cover;
5 a back plane including a plurality of edge connectors and
6 a host connector to couple to a host system;
7 a plurality of vertical printed circuit boards each

8 having an edge connector and an optoelectronic device coupled
9 thereto in parallel to the optical axis of the optoelectronic
10 device, the plurality of vertical printed circuit boards each
11 having its respective edge connector coupled to the respective
12 edge connector of the back plane; and
13 a housing coupled to the cover to protect the plurality
14 of vertical printed circuit boards.

1 23. The fiber optic module of claim 22 further
2 comprising:

3 an optical block coupled to each of the optoelectronic
4 devices of the plurality of vertical printed circuit boards,
5 the optical block having

6 a plurality of openings to receive each of the
7 optoelectronic devices of the plurality of vertical printed
8 circuit boards, and

9 a plurality of lenses to couple photons between each of
10 the optoelectronic devices of the plurality of vertical
11 printed circuit boards and a plurality of optical fibers
12 respectively.

1 24. The fiber optic module of claim 23 further
2 comprising:

3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the plurality of openings of the optical block.

1 25. The fiber optic module of claim 24 further
2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 26. The fiber optic module of claim 22 wherein,
2 the back plane includes traces between the plurality of
3 edge connectors and the host connector.

1 27. The fiber optic module of claim 22 wherein,
2 the host connector is a plurality of pins.

1 28. The fiber optic module of claim 22 wherein,
2 the host connector is an electrical connector including a
3 plurality of pins.

1 29. The fiber optic module of claim 22 further
2 comprising:
3 a plurality of optical blocks coupled to each of the
4 optoelectronic devices of the plurality of vertical printed
5 circuit boards, the plurality of optical blocks having
6 a plurality of openings to receive each of the
7 optoelectronic devices of the plurality of vertical printed
8 circuit boards, and
9 a plurality of lenses to couple photons between each of
10 the optoelectronic devices of the plurality of vertical
11 printed circuit boards and a plurality of optical fibers
12 respectively.

1 30. The fiber optic module of claim 29 further
2 comprising:
3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the plurality of openings of the optical block.

1 31. The fiber optic module of claim 30 further

2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 32. The fiber optic module of claim 22 wherein,
2 the housing is a shielded housing which is conductive.

1 33. The fiber optic module of claim 32 wherein,
2 each of the plurality of vertical printed circuit boards
3 includes a ground plane on one side.

1 34. The fiber optic module of claim 22 wherein,
2 each of the plurality of vertical printed circuit boards
3 includes a ground plane on one side.

1 35. The fiber optic module of claim 22 wherein,
2 each optoelectronic device of the plurality of vertical
3 printed circuit boards is coupled thereto using a straddle
4 mount configuration.

1 36. The fiber optic module of claim 22 wherein,
2 each optoelectronic device of the plurality of vertical
3 printed circuit boards is coupled thereto using a through hole
4 mount configuration.

1 37. The fiber optic module of claim 22 wherein,
2 each of the plurality of vertical printed circuit boards
3 is perpendicular to the base to form a horizontal array of
4 fiber optic channels.

1 38. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic

3 module comprising:
4 a cover;
5 a back plane including a plurality of edge connectors and
6 a host connector to couple to a host system;
7 a plurality of horizontal printed circuit boards each
8 having an edge connector and an optoelectronic device coupled
9 thereto in parallel to the optical axis of the optoelectronic
10 device, the plurality of horizontal printed circuit boards
11 each having its respective edge connector coupled to the
12 respective edge connector of the back plane; and
13 a housing coupled to the cover to protect the plurality
14 of horizontal printed circuit boards.

1 39. The fiber optic module of claim 38 further
2 comprising:
3 an optical block coupled to each of the optoelectronic
4 devices of the plurality of horizontal printed circuit boards,
5 the optical block having
6 a plurality of openings to receive each of the
7 optoelectronic devices of the plurality of horizontal printed
8 circuit boards, and
9 a plurality of lenses to couple photons between each of
10 the optoelectronic devices of the plurality of horizontal
11 printed circuit boards and a plurality of optical fibers
12 respectively.

1 40. The fiber optic module of claim 39 further
2 comprising:
3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the plurality of openings of the optical block.

1 41. The fiber optic module of claim 40 further

- 2 comprising:
- 3 a nose shield surrounding the nose to reduce
- 4 electromagnetic interference.
- 1 42. The fiber optic module of claim 38 wherein,
- 2 the back plane includes traces between the plurality of
- 3 edge connectors and the host connector.
- 1 43. The fiber optic module of claim 38 wherein,
- 2 the host connector is a plurality of pins.
- 1 44. The fiber optic module of claim 38 wherein,
- 2 the host connector is an electrical connector including a
- 3 plurality of pins.
- 1 45. The fiber optic module of claim 38 further
- 2 comprising:
- 3 a plurality of optical blocks coupled to each of the
- 4 optoelectronic devices of the plurality of horizontal printed
- 5 circuit boards, the plurality of optical blocks having
- 6 a plurality of openings to receive each of the
- 7 optoelectronic devices of the plurality of horizontal printed
- 8 circuit boards, and
- 9 a plurality of lenses to couple photons between each of
- 10 the optoelectronic devices of the plurality of horizontal
- 11 printed circuit boards and a plurality of optical fibers
- 12 respectively.
- 1 46. The fiber optic module of claim 45 further
- 2 comprising:
- 3 a nose to receive an optical fiber connector and to hold
- 4 the plurality of optical fibers substantially fixed and

5 aligned with the plurality of openings of the optical block.

1 47. The fiber optic module of claim 46 further
2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 48. The fiber optic module of claim 38 wherein,
2 the housing is a shielded housing which is conductive.

1 49. The fiber optic module of claim 38 wherein,
2 each of the plurality of horizontal printed circuit
3 boards includes a ground plane on one side.

1 50. The fiber optic module of claim 38 wherein,
2 each of the edge connectors of the plurality of
3 horizontal printed circuit boards includes one or more
4 staggered pads to plug in the printed circuit board when the
5 fiber optic module is hot.

1 51. A fiber optic module for coupling photons between
2 optoelectronic devices and optical fibers, the fiber optic
3 module comprising:

4 a base;

5 a back plane including a plurality of edge connectors and
6 a host connector to couple to a host system;

7 a plurality of printed circuit boards each having an edge
8 connector and an optoelectronic device coupled thereto in
9 parallel to the optical axis of the optoelectronic device,
10 each of the respective edge connectors of the plurality of
11 printed circuit boards having staggered pads to couple to
12 respective edge connectors of the back plane when powered up;

13 and

14 a housing coupled to the base to protect the plurality of
15 printed circuit boards.

1 52. The fiber optic module of claim 51 further
2 comprising:

3 an optical block coupled to each of the optoelectronic
4 devices of the plurality of printed circuit boards, the
5 optical block having

6 a plurality of openings to receive each of the
7 optoelectronic devices of the plurality of printed circuit
8 boards, and

9 a plurality of lenses to couple photons between each of
10 the optoelectronic devices of the plurality of printed circuit
11 boards and a plurality of optical fibers respectively.

1 53. The fiber optic module of claim 52 further
2 comprising:

3 a nose to receive an optical fiber connector and to hold
4 the plurality of optical fibers substantially fixed and
5 aligned with the plurality of openings of the optical block.

1 54. The fiber optic module of claim 53 further
2 comprising:

3 a nose shield surrounding the nose to reduce
4 electromagnetic interference.

1 55. The fiber optic module of claim 51 wherein,
2 the back plane includes traces between the plurality of
3 edge connectors and the host connector.

1 56. The fiber optic module of claim 51 wherein,

2 the host connector is a plurality of pins.

1 57. The fiber optic module of claim 51 wherein,
2 the host connector is an electrical connector including a
3 plurality of pins.

1 58. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards is a plurality of
3 vertical printed circuit boards.

1 59. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards are a plurality
3 of vertical printed circuit boards each arranged perpendicular
4 to the base and parallel to each other to form a horizontal
5 array of fiber optical channels.

1 60. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards are a plurality
3 of vertical printed circuit boards each arranged perpendicular
4 to the base to form a vertical array of fiber optical
5 channels.

1 61. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards is a plurality of
3 horizontal printed circuit boards.

1 62. The fiber optic module of claim 61 wherein,
2 the plurality of horizontal printed circuit boards are
3 each arranged parallel to the base to form a horizontal array
4 of fiber optical channels.

1 63. The fiber optic module of claim 61 wherein,

2 the plurality of horizontal printed circuit boards are
3 each arranged parallel to the base and to each other to form a
4 vertical array of fiber optical channels.

1 64. The fiber optic module of claim 61 wherein,
2 the plurality of printed circuit boards is a plurality of
3 slanted printed circuit boards.

1 65. The fiber optic module of claim 64 wherein,
2 the plurality of slanted printed circuit boards are each
3 arranged parallel to each other to form a vertical array of
4 fiber optical channels.

1 66. The fiber optic module of claim 64 wherein,
2 the plurality of slanted printed circuit boards are each
3 arranged parallel to each other on an angle with the base to
4 form a horizontal array of fiber optical channels.

1 67. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards is a combination
3 of slanted printed circuit boards and vertical printed circuit
4 boards.

1 68. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards is a combination
3 of slanted printed circuit boards and horizontal printed
4 circuit boards.

1 69. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards is a combination
3 of vertical printed circuit boards and horizontal printed
4 circuit boards.

1 70. The fiber optic module of claim 51 wherein,
2 the plurality of printed circuit boards is a combination
3 of vertical printed circuit boards, horizontal printed circuit
4 boards and slanted printed circuit boards.

1 71. The fiber optic module of claim 51 wherein,
2 each of the plurality of printed circuit boards includes
3 a ground plane on one side.

72. The fiber optic module of claim 51 wherein,
each of the edge connectors of the plurality of printed
circuit boards includes one or more staggered pads to plug in
the printed circuit board when the fiber optic module is hot.